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Juncus tenuis Willd. and some of its North American Allies

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Several years ago while working over the forms of *Juncus* occurring in the flora about Ithaca, N. Y., the writer was led to the conclusion that there are really several good species included in the *tenuis* group instead of only one or two as most writers have heretofore affirmed. Since that time many field notes have been accumulated, and these together with the information derived from a large series of herbarium specimens have led to the results presented in the present paper.

Juncus tenuis and its allies may be treated in either of two ways. They may all be referred to one or two composite specific types as has heretofore been done by most authors, including Buchenau in his elaborate monograph of the genus; or the composite types may be broken up into their component parts. The latter method seems more proper since the lines of development are all quite distinct, and the various forms really represent separate kinds of plants. The endeavor has been to treat these forms as conservatively as possible, admitting new species only when appearing quite distinct and when represented by a sufficient number of specimens to guarantee constancy of characters. This has led to the result that in a few cases quite diverse forms are still united under one species. Some of these quite likely will be raised to specific rank when more material is available.

The characters used, it will be seen, are in many cases quite different from those commonly employed for the separation of species of *Juncus*. Considerable stress has been placed upon the

vegetative characters, especially those referring to the sheath and its auricles as well as upon the leaf-blade, perianth and capsule. The seeds have not been found of great service since in this group except in one or two cases they are very much alike. Neither has the density of the inflorescence served definitely to distinguish species, since in many species this seems to be influenced greatly by the conditions of growth, soil, exposure, etc. The species are all perennial and all have six stamens, consequently these characters are omitted from the following descriptions.

Through the kindness of Professor Robinson it was possible to supplement the Cornell Herbarium material with all the material in the Gray Herbarium. The New England Botanical Club also loaned many specimens from the Eastern States, and Mr. M. L. Fernald placed at the writer's disposal a large mass of material from various localities in Maine.

Synopsis of the Species

Sheaths covering one half the length of the stem or more ; perianth parts obtuse, equaling or shorter than the 3-celled capsule. 1. *J. Gerardi*.

Sheaths covering only about one fourth of the stem ; perianth segments acute or pungent.

Seeds long-caudate ; leaves terete, bracts scarcely exceeding the stramineous inflorescence ; perianth (3.5-4.5 mm.) equaling the oblong 3-celled capsule. 2. *J. Caseyi*.

Seeds not caudate.

Capsule longer than the small (2.5-3 mm.) perianth, 3-celled ; leaves terete, bracts much exceeding the fuscous cyme. 3. *J. Greenii*.

Capsule equaling or shorter than the commonly larger (2.5-5 mm.) perianth ; leaves various.

Leaves flat but often involute, cross-section lunate.

Auricles at summit of sheath membranous, whitish, scarcely scarious, rarely produced beyond the insertion ; capsule 3-celled or nearly so ; perianth scarcely spreading, often appressed.

Perianth small (2.5-4 mm.), equaling the capsule.

Flowers conspicuously secund, 2.5-3.5 mm. long ; capsule oval ; plant slender with close sheaths ; bract shorter than the cyme. 4. *J. secundus*.

Flowers scarcely secund, 3-4 mm. long ; capsule ovate-oblong ; plant taller and stouter, much looser sheaths ; bracts 2, exceeding the cyme. 5. *J. interior*.

Perianth larger (4.5-5 mm.), exceeding the capsule.

Plant stout, 4-7 dm. high ; anthers and style very short.

6. *J. Arizonicus*.

Plant more slender, 3 dm. high ; anthers linear, exceeding the filaments ; styles often 1-1.5 mm. long.

7. *J. Georgianus*.

Auricles scarious, whitish, conspicuously produced beyond the point of insertion.

Capsule oblong, often narrow, 3-celled, equaling the perianth or nearly so, segments of the latter erect or appressed, cyme not crowded.

Stem stout; leaves short and broad (1.5–2 mm.); perianth 4 mm. long, scarious at the base, very acute, stramineous; cyme somewhat open. 8. *J. brachyphyllus*.

Stem slender; leaves narrow and longer; perianth 3.5–4 mm. long, scarious to the apex, acute, not pungent, fuscous; flowers few, densely congested.

9. *J. confusus*.

Capsule ovate or oval, 1-celled, three-fourths the length of the perianth or less, segments of the latter more or less spreading.

Flowers fuscous, congested; perianth parts nearly erect, 4–5 mm. long; capsule oval, firm; plant very stout, with conspicuous broad sheaths.

10. *J. occidentalis*.

Flowers greenish, distant (rarely congested); perianth conspicuously spreading, 3–4.5 mm. long; capsule ovate-oval, thin-walled; plant more slender.

11. *J. tenuis*.

Auricles cartilaginous, yellowish-brown; inflorescence greenish, small, usually congested; perianth spreading; capsule ovate, thin-walled.

12. *J. Dudleyi*.

Leaves terete, barely grooved on the upper side; inflorescence brownish, usually open; auricles nearly cartilaginous; capsule ovate, 1-celled; perianth spreading.

13. *J. dichotomus*.

1. *JUNCUS GERARDI* Loisel. Journ. d. Bot. 2: 284. 1809

J. bulbosus Bigelow, Torrey and Pursh. Not L.

Stems loosely tufted, rather stout and strict below, 3–6 dm. high, slightly compressed, slender at the summit: leaves erect or spreading, flat or slightly involute, grass-like, nearly equaling the culm; sheaths 4–6, all blade-bearing, the lower loose, the upper close and reaching the middle of the stem or even higher, margins and small auricles membranous: inflorescence small, 2–7 (rarely 12) cm. long, many-flowered, open but not diffuse, ultimate branches short, bearing 1–2 flowers at the extremity; bracts usually equaling the inflorescence; bracteoles ovate-subrotund, small, rounded: perianth small, 2.5–3 mm. long, the parts dark-fuscous with green midrib, nearly equal in length; the outer linear, convex, apex obtuse and incurved, margins narrowly scarious; the inner oval obtuse with broadly scarious margins: stamens nearly as long as the perianth, anthers linear, much exceeding the filaments; style

long and stout, stigmas very long : capsule broadly oval or obovoid, rounded above and strongly apiculate, equaling or slightly exceeding the perianth, placentae meeting at the axis or nearly so : seeds broadly oblong (.5-.6 mm. \times .3-3.5 mm.), short-blunt-pointed at each end, marked with 12-15 distinct longitudinal ridges, the spaces between inconspicuously reticulated.

Salt marshes along the coast from Newfoundland to Florida, also inland in central New York, and on the Pacific Coast at Vancouver Island (Macoun). Specimens were examined from nearly all parts of this region.

In America this is a very distinct species seeming to be quite constant in its characters over our whole region, but in Europe *J. compressus* Jac. is so close a relative as to make distinction difficult. The position of the leaves upon the stem and the short blunt perianth divisions form two very conspicuous characters, and by these it may be distinguished from all other species treated in this paper.

2. JUNCUS VASEYI Engelm. Trans. St. Louis Acad. Sci. 2 : 448.
1866

Stems more or less tufted, tall and stiff, erect, rather slender (3-8 dm. high), nearly terete : leaves very long (25-40 cm.), about $\frac{3}{4}$ length of culm, rigid and erect, terete, the groove very shallow or wanting ; blade-bearing sheaths commonly only one, rarely two, short, rather close, the margins and short auricles semi-membranous, not scarious, lower sheaths bladeless and purple : inflorescence small, rather crowded (10-35 mm. long), branches erect, each with 2-4 sessile scattered flowers ; bracteoles obtuse and rounded : perianth 3.5-4 mm. long, green or stramineous, rigid, the parts erect or appressed, equal and similar, lanceolate, all acute and narrowly scarious margined : stamens one half the length of the perianth, anthers linear-oblong, nearly as long as the filaments : stigmas short, sessile or nearly so : capsule 4-5 mm. long, oblong-cylindrical, obtuse, slightly exceeding the perianth ; placentae meeting at the axis : seeds .85-1.10 \times .1-.15 mm. including the tail, sigmoid-spindle-shaped, caudate at each end, the tails over one half the length of the body, marked with about 15 very low longitudinal anastomosing ridges, not reticulated between.

Moist shores and wet woods, Maine and Ontario along the lakes to the Saskatchewan, Iowa and Colorado. Specimens examined from various places both in the East and in the West.

Easily distinguished from other allies of *J. tenuis* by the

spindle-shaped, distinctly caudate seeds, to which character must be added the terete leaves and fuscous oblong capsules slightly exceeding the perianth. *J. Vaseyi* and *J. Greenei* form a distinct and easily recognized group among the forms of grassy-leaved *Junci*.

3. *JUNCUS GREENEI* Oakes & Tuck. Am. Journ. Sci. **45**: 37. 1843

Perennial, tufted: stem stiff and erect, quite stout, 3–7 dm. high, terete, strongly grooved: leaves half as long as the culm or less, flexuous, terete, the groove deeper than in the last; at least two sheaths blade-bearing, loose, not scarious: auricles very short, thickish: inflorescence short (2–5 cm. long), crowded and many-flowered, fuscous: bracts long and flexuous, much exceeding the culm, filiform, spreading or reflexed; bracteoles short, rounded: perianth small (2.5 mm. long), fuscous, the parts all nearly similar, triangular-subulate, acute, broad and short, midrib green, margins broadly scarious: stamens 6, one half the length of the perianth, anthers oblong-linear, equaling the filament: style very short and stout, stigmas short: capsule narrowly oblong-ovate, obtuse, much longer than the perianth, placentae meeting at the axis: seeds oblong (.48–.54 × .20 mm.), apiculate at each end, coarsely reticulated, longitudinal ridges inconspicuous.

In damp woods or grassy places, New Brunswick to New Jersey near the coast, and sparingly through the lake region to Wisconsin. Specimens examined from Maine, Massachusetts, Rhode Island, New Hampshire, Vermont and Michigan.

4. *JUNCUS SECUNDUS* Beauv.; Poir. Encyc. Suppl. **3**: 160.
1813

J. tenuis secundus Engelm. Trans. St. Louis Acad. Sci. **2**, 450. 1866.

Densely tufted, slender, wiry, strict and erect (3–5 dm. high): culm nearly terete, strongly 6–8-grooved above, light green: leaves densely tufted, flat, one third length of culm or less, short and very narrow; sheaths narrow (2 mm. wide or less) the upper rather close, margins and rounded auricles membranous, not scarious, all blade-bearing; bracts one (rarely two), setaceous, shorter than the medium-sized (3–8 cm. long) open inflorescence; branches of the latter strongly ascending, 3–7-flowered, conspicuously secund: bracteoles ovate-oblong, scarious, obtusish or cuspidate: perianth stramineous, rather small (2.5–3.5 mm. long), the parts erect or only slightly spreading, all similar, broadly lance-

subulate, acute, midrib green, margins moderately scarious: stamens two thirds length of the perianth, anthers oblong-linear, slightly exceeding the filament: capsule oval-oblong, obtuse, scarcely apiculate, nearly equaling the perianth; placentae meeting at the axis: seeds oblong or ovate, irregularly curved, apiculate at each end (.28-.37 \times .14-.17 mm.), with about 12-14 rows of transversely oblong shallow areoles.

Dry soil, Massachusetts to North Carolina along the coast.

Specimens examined:

MASSACHUSETTS: Medford (Boott, 1872); Winchester (G. P. Huntington, 1879).

RHODE ISLAND: (Olney).

PENNSYLVANIA: Lancaster (Porter and Leidy, Junc. Bor. Am. Engelm. no. 23, 1866).

DELAWARE: New Castle Co. (W. M. Canby, 1874).

NEW YORK: Pine Plains (L. H. Hoysradt, 1878).

In general appearance *J. secundus* is very distinct. It is especially characterized by the slender culm bases, membranous auricles, tufted leaves, short bracts, small secund flowers, scarcely spreading perianth, long anthers and placentae meeting at the axis. It seems to be confined to the Atlantic coast, while the Mississippi Vally forms heretofore ascribed to it are to be referred to a distinct species, *J. interior*.

5. *Juncus interior* sp. nov.

Tall and rather stout (5-10 dm. high), light green: stem erect, nearly terete, coarsely grooved: leaves several, about one third length of culm, blades narrow (1-1.25 mm. wide), flat or involute: sheaths nearly all blade-bearing, large and loose, margin and short rounded auricles membranous, often slightly yellowish: inflorescence large and open, very many flowered, 3-10 cm. long, branches conspicuously ascending: flowers distant and scattered, not secund, pale stramineous: bracts commonly two, exceeding the inflorescence: bracteoles acuminate: perianth 3-4 mm. long, its parts nearly equal, broadly subulate, very acute, scarious margin narrow, extending on the inner to the tip, all appressed or erect: stamens one half the length of the perianth: anthers short-oblong, much shorter than the filaments: styles very short: capsule oblong or rarely ovate-oblong, obtuse, barely apiculate, equaling the perianth; placentae not quite meeting at the axis except at the ends: seeds oblong, rather small (.35-.50 \times .14-.17 mm.), apiculate at both ends, shallowly areolate.

Illinois to Wyoming, in dry woods and prairies.

Specimens examined :

ILLINOIS: Richmond (Vasey in Gray Herb.; type), between Urbana and Centralia (Vasey), Athens (E. Hall,—Junc. Bor. Am. Engelm. no. 21); Illinois Dr. Mead, no. 23.

WYOMING: Grand Enchantment Creek (A. Nelson, no. 3982, 1897).

Juncus interior has previously constituted the main part of the so-called *J. secundus* of the Mississippi valley. Closer observation shows however that it is quite distinct as well in structure as in area of distribution. *J. secundus* is always a slender plant with rather close sheaths, while the present species is commonly tall and stout with much broader sheaths. The two species also differ in the larger inflorescence of the latter, with larger flowers which are not secund, shorter anthers and more oblong capsule. The bracts also much exceed the inflorescence, while in *J. secundus* they usually do not.

6. *Juncus Arizonicus* sp. nov.

Sparingly tufted, tall and stout (4–7 dm. high), erect and rather stiff, quite pale; culm terete or slightly compressed, coarsely grooved: leaves $\frac{1}{3}$ – $\frac{1}{2}$ the length of the culm, large, broad and flat, rarely involute, sometimes lax (often 1 mm. wide); sheaths numerous and conspicuous, nearly all blade-bearing, very loose and papery, often expanded, stramineous or brownish, margins and rounded auricles membranous, scarcely scarious: inflorescence stramineous, many-flowered, open but rather crowded (4–7 cm. long), the branches erect; bracts 2–3 foliaceous, much exceeding the inflorescence; bracteoles strongly cuspidate: flowers large and rather distant: perianth large (about 5 mm. long), the parts lance-subulate, rigid and very acute, nearly equal, erect or appressed, rarely at all spreading: stamens about one half the length of the perianth; anthers elongated-oblong, about equaling the filament: style very short: capsule rather narrow, ovate-oblong, obtuse, barely apiculate, triangular above, firm in texture, conspicuously shorter than the perianth; placentae meeting at the ends and nearly so at the middle: seeds oblong or ovate, irregularly curved (.30–.37 × .17–.21 mm.), apiculate, marked with about 12–14 rows of shallow transversely oblong areoles.

Arizona and New Mexico.

Specimens examined:

N. MEXICO: Copper Mines (Geo. Thurber, type in Gray Herb.); N. Mexico (A. Fendler, no. 856).

ARIZONA: Apache Pass (Lemmon, no. 310).

***Juncus Arizonicus curtiflorus* var. nov.**

Commonly more slender, sheaths frequently closer: leaves nearly filiform: inflorescence smaller (3–5 cm. long): flowers smaller, perianth only 4 mm. long, scarcely exceeding the broader and shorter, more ovate capsule; placentae more widely separated.

Arizona, New Mexico and Texas. Possibly a distinct species.

Specimens examined:

ARIZONA: Flagstaff (D. T. MacDougal, no. 305, type in Gray Herb.).

NEW MEXICO: (C. Wright, no. 1922).

TEXAS: Houston (E. Hall, no. 661, 1872).

Intermediate in some respects between *Juncus confusus* and *J. tenuis*; differing from the former in its membranous auricles, larger perianth, comparatively shorter capsule, open stramineous inflorescence, and stouter habit; and from the latter in its membranous auricles, more oblong firm-walled capsule, scarcely spreading perianth, and erect branches. It is one of the largest species of this group. The tall stout culms are densely clothed at the base with the numerous papery and very loose sheaths. Some of the specimens differ markedly in their smaller flowers and other characters, thus warranting their separation as a distinct variety as above.

7. *JUNCUS GEORGIANUS* Coville, Bull. Torr. Club, 22: 44. 1895

Densely tufted, 3 dm. high, erect, but somewhat weak, slender: culms striate-grooved, nearly terete: leaves very numerous, rather long ($\frac{1}{3}$ – $\frac{1}{2}$ length of culm), blade narrow, quite thick and rigid, but flattish with a broad open groove, coarsely striate on the back; sheaths close except the lower which are bladeless and expanded, all greenish-stramineous, margins membranous, auricles short, rounded, membranous, or slightly cartilaginous in some cases, not scarious: inflorescence large for the plant (6–10 cm. long), very lax and distantly flowered: bracts filiform, equaling the inflorescence or usually much shorter: bracteoles ovate, acute: perianth 4.5–5 mm. long, the parts nearly equal, lance-subulate, very acute, midrib green with a fuscous stripe on each side and a narrow

scarious margin extending to the tip of the inner parts : stamens about one half the length of the perianth : anthers long-linear, much exceeding the filament : style quite long (1 mm.) for this group : capsule about three fourths length of the perianth, narrowly oblong-lanceolate, obtuse or broadly acute, mucronate, 3-celled : seeds about .4-.5 mm. long, oblong, reticulated, the areoles linear and transversely arranged in about sixteen longitudinal rows.

Georgia, Stone Mountain (Canby, Small), Little Stone Mountain (Small).

Specimen examined :

Stone Mountain, Georgia (Canby in Gray Herb.).

The above description of this extraordinary *Juncus*, with the exception of the part relating to the fruit, was drawn from a portion of the type material in the Gray Herbarium. This was in the flowering condition, and the fruit characters were added from Mr. Coville's original description.

The species seems to be very local in distribution having been found only in the limited locality given above, where it was first discovered by Mr. Canby, and later according to Mr. Coville was again collected by Dr. Small. In general appearance it is not very different from *J. tenuis*, but lacks the scarious auricles while the very long anthers and style designate it as a very anomalous form for this group where all other species except *J. Gerardi* have short anthers and styles.

8. *Juncus brachyphyllus* sp. nov.

Culm stiff, erect and very stout, 4-5 dm. high (1.25-1.5 mm. diam.), slightly compressed, very conspicuously grooved ; leaves short, $\frac{1}{4}$ - $\frac{1}{3}$ the length of the culm, the blade unusually broad and flat but rather thick, stiff and spreading (1.5-2 mm. wide), rarely at all involute ; sheaths all but the lowest blade-bearing, loose and mostly free, pale, margins membranous, auricles produced and mostly scarious : inflorescence short, crowded, many-flowered (2-6 cm. long), stramineous, the branches ascending, sometimes elongated to 2.5 cm., sometimes all capitate ; bracts 2-9 cm. long, leaf-like, usually exceeding the inflorescence ; bracteoles acute or cuspidate : perianth rather large, the parts appressed, 5 mm. long, slightly unequal, subulate, very acute, narrowly scarious toward the base, inner scarious all around : stamens about one half the length of the perianth ; anthers oblong nearly

equaling the filament : styles short (.5 mm. long) : capsule firm, rather narrowly oblong, triangular above, obtuse or retuse, equaling the perianth ; placentae completely meeting at the axis : seeds quite large, oblong (.5-.55 × .2 mm.) rather slender and strongly, often obliquely, apiculate at each end, areolate.

Arkansas to Idaho.

Specimens examined :

ARKANSAS : (Between Morka and Red Fork) (Marcy's Exped. Herb. G. Thurber); Upper Platte (Hayden in Gray Herb. type).

IDAHO : (Lake Waha) (Heller, no. 3410, 1896).

The limited material of this species makes its range rather doubtful. It is closely related to *Juncus confusus* in flower and fruit characters, indeed differs from that species only in its more acute perianth segments, more open paler inflorescence, and especially in the stout culm and short broad leaves. It differs from *J. interior* in the large scarious auricles and larger perianth.

9. JUNCUS CONFUSUS Coville, Proc. Biol. Soc. Wash. **10** : 127.

1896

Strict but slender, 4-5 dm. high, erect, light green : culms moderately grooved, sparingly tufted : leaves very narrow, nearly filiform, two thirds the length of the culm or less, flat and unusually thick, commonly also involute ; sheaths short, narrow, close, some of the lower bladeless and looser, yellowish-white, margins and produced auricles scarious, the latter whitish : inflorescence very short, compact, capitate (.5-2 cm. long), pale fuscous ; bract 2-7 cm. long, filiform, exceeding the inflorescence ; bracteoles large, ovate, scarious, obtuse or acutish : perianth small (3.5-4 mm. long), the parts nearly equal, appressed, lanceolate, acutish, stramineous with a fuscous stripe on each side, margins all rather broadly scarious to the apex : stamens one-half the length of the perianth : anthers oblong, shorter than the filament : styles quite short : capsule firm, oblong, a little shorter than the perianth, conspicuously triangular and retuse at the apex, placentae completely meeting at the axis : seeds large, oblong, apiculate and often oblique at the ends (.45-.50 × .2 mm.), coarsely and shallowly areolate.

Colorado to Montana and possibly Idaho.

Specimens examined :

COLORADO : (Hall and Harbour), Chicken Creek (Baker, Earle and Tracy, no. 742, 1898).

WYOMING : Battle Lake (A. Nelson, no. 4004), Laramie Peak (A. Nelson, no. 1631).

Juncus confusus includes all of the so-called *J. tenuis* var. *congestus* of the Rocky Mountain region except that here ascribed to *J. brachyphyllus*. It differs from the true *J. tenuis congestus* Engelm. (*J. occidentalis*) in its more slender habit, longer capsule, smaller flowers and more congested heads, and from *J. brachyphyllus* in its much denser heads, more slender habit, and especially in its narrow leaves and fuscous perianth. It seems rather widely distributed but does not appear abundantly in the herbaria.

10. ***Juncus occidentalis*** (Coville) nom. nov.

J. tenuis congestus Engelm. Trans. St. Louis Acad. Sci. 2: 450. 1866. Not *J. congestus* Thuill.

J. tenuis occidentalis Coville, Proc. Biol. Soc. Wash. 10: 129. 1896.

Tall, stiff and erect (3–6 dm. high), from a stout base, pale green; stem nearly terete, finely striate; leaves one third to one half the length of the culm, numerous and densely tufted at the base, rather coarse, flat and flexuous, 1–1.5 mm. wide; sheaths all blade-bearing, loose and expanded, brownish, the margins and short auricles whitish and scarious; inflorescence several- or many-flowered, glomerate or more commonly somewhat open (1.5–3 cm. long), fuscous; bract one, leaf-like, about 5 cm. long, exceeding the inflorescence; bracteoles broadly ovate, obtuse or mucronate; perianth large (4–5 mm. long), the parts lance-subulate, slightly unequal in length, erect or somewhat spreading, fuscous with green midrib and rather broad scarious margin extending to the apex, the inner more broadly scarious and with a narrower midrib; stamens one half the length of the perianth, anthers oblong, much shorter than the filaments; styles very short; capsule firm, broad, ovate-oval or oblong-oval, obtuse, when mature strongly retuse, not over three fourths the length of the perianth, fuscous, placentae extending only about one half way to the axis; seeds oblong or irregular, apiculate at each end (.34–.43 mm. long), areolate-reticulated, not striate.

Central California to Oregon.

Specimens examined.

CALIFORNIA: (Bolander, also Oakland Hills, no. 417, and no. 23), Berkeley (J. W. Blankinship), Bolinas Bay (A. Kellogg, Junc. Bor. Am. Engelm. no. 22), Redwood Hills, Watsonville (A. Wood, 1868), Yosemite Val. (Torrey, no. 534, 1865), Sonoma Co. (J. W. Congdon) (Kellogg and Harford, no. 1043).

OREGON: Klamath Co. (E. I. Applegate, no. 748), Waldo (Howell, 1884).

Differs from *Juncus tenuis* in the larger, fuscous, congested flowers with scarcely spreading perianth, more oval and firmer capsule, stouter, taller stem with more numerous basal leaves, and from *J. confusus* in its short capsule and coarser leaves. It sometimes becomes quite robust, in which case the inflorescence may become more open. In general, this species is decidedly more strict than *J. tenuis*.

It differs from its closest relative, *Juncus brachyphyllus*, in its larger, fuscous, more spreading perianth, much shorter retuse oval capsule, which is only three fourths the length of the perianth, the placentae not meeting at the axis, and the seeds not being quite so long. It agrees with *J. confusus* in having the same retuse apex to the capsule and very scarious margins to the perianth segments, but the whole flower is much larger.

11. JUNCUS TENUIS Willd. Sp. Pl. 2: 214. 1799

J. bicornis Michx. Fl. Bor. Am. 1: 191. 1803.

Tufted, rather low, bright green: culms 2-6 dm. high, commonly spreading, slightly flattened and finely striate, often stout: leaves long, one half to nearly the full length of the culm, narrow (1-1.25 mm.), lax, flat and soft, rarely slightly involute; sheaths all blade-bearing, short, loose and often expanded, greenish-brown, margins and the large extended auricles (often 1.5 mm. long) very scarious: inflorescence pale green, many-flowered, moderately open (1-7 cm. long), flowers somewhat aggregated near the ends of the very unequal branches: bracts 2 rarely 3, foliaceous, much exceeding the inflorescence: bracteoles triangular-ovate, acutish: perianth variable in size (3-4.5 mm. long), parts all nearly similar but the inner slightly shorter, lanceolate, very acute, green with white-scarious margins, conspicuously spreading: stamens one half the length of the perianth; anthers short, oblong, much shorter than the filament: capsule thin-walled, broadly ovoid, shorter than the perianth, obtuse, very obscurely triangular above, scarcely apiculate: placentae not reaching half way to the axis: seeds (.33-.40 × .14-.17 mm.) oblong, bluntly apiculate at each end, reticulated, areoles large, transversely oblong.

Dry roadsides and grassy places, Newfoundland to Florida and westward to Texas, northwestward to Oregon and Washington.

Specimens examined:

- NEWFOUNDLAND : (Robinson and Schrenk, no. 130).
 QUEBEC : (Mrs. Sheppard, 1827).
 MAINE : Many localities (Fernald, Parlin, Furbish).
 NEW HAMPSHIRE : Jaffrey (B. L. Robinson, nos. 174, 303).
 MASSACHUSETTS : Many localities about Boston (N. E. Bot. Cl., Gray Herb.).
 RHODE ISLAND : (Olney), Providence (J. F. Collins).
 CONNECTICUT : (L. Andrews, no. 189), New Haven (J. A. Allen).
 NEW YORK : Many specimens from near Ithaca.
 PENNSYLVANIA : Lancaster (Porter in Gray Herb., also Junc. Bor. Am. Engelm. no. 20).
 VIRGINIA : Princess Anne Co. (Heller, no. 1070).
 NORTH CAROLINA : Swain Co. (Beardslee and Kofoid).
 SOUTH CAROLINA : (Ravenel).
 FLORIDA : (A. H. Curtiss, no. 2985).
 LOUISIANA : (J. Hale).
 MICHIGAN : Keweenaw Co. (O. A. Farwell, no. 468a), Port Huron (C. K. Dodge, no. 27).
 MINNESOTA : Mille Lacs Co. (E. P. Sheldon).
 ARKANSAS : (F. L. Harvey, no. 24).
 IOWA : Stone City (R. Combs & C. R. Ball, no. 414).
 IDAHO : Nez Perces Co. (Sandberg, MacDougal and Heller, no. 379).
 WASHINGTON : Pullman (Piper); Seattle (Piper, no. 1134), Chelalis Co. (Heller, no. 4074), near var. *anthelatus*.
 OREGON : (E. Hall, no. 540).

***Juncus tenuis anthelatus* var. nov.**

Tall and rather stiff (5-9 dm. high); leaves broader; sheaths numerous and loose, often causing the base of the stem to appear very stout: inflorescence very large, open and diffuse (5-15 cm. long), the flowers more scattered and, except in a few cases, smaller (2.5-3.5 mm. rarely 4 mm.): capsule not over three fourths the length of the perianth, round-ovate, shining, rarely larger.

Maine to Florida and Texas, mostly along the coast; possibly also in the State of Washington.

Specimens examined :

MAINE : Hartford (J. C. Parlin), Orono (M. L. Fernald).

MASSACHUSETTS: Lexington (C. H. Knowlton).

VIRGINIA: Carroll Co. (Small).

SOUTH CAROLINA: (M. A. Curtis).

TEXAS: Houston (E. Hall, no. 663).

MISSOURI: Butler Co. (H. Eggert).

This is much more common and more widely distributed than any other species in the group, being especially abundant throughout the eastern United States. Although Willdenow's type has not been studied there seems little doubt from the locality and description given that it really was of this species. The more diffuse habit, scarious auricles, many-flowered inflorescence with flowers mostly near the ends of the branches, spreading sepals, and thin-walled one-celled capsule make *J. tenuis* a very distinct species indeed. It is, however, very variable and future study may separate several more good species. In Washington and Oregon the perianth shows a tendency to become fuscous, although never so dark as in *Juncus occidentalis* and *J. confusus*.

The var. *anthelatus* seems to be distinct from *J. tenuis* var. *laxiflorus* E. Fisk. Ber. d. Schles. Gesells. 168, 1890.

11. *Juncus Dudleyi* sp. nov.

Pale green: stems tufted, often very large and stout, 3-10 dm. high, stiff, erect and wiry, prominently striate-grooved: leaves short, one half the length of the culm or usually less, narrow but flat, frequently involute; sheaths rather close, all blade-bearing, margins not scarious, auricles rounded, thick and cartilaginous, yellowish or reddish in color: inflorescence small and rather dense 2-5 (rarely 7) cm. long, few-flowered, exceeded by the short filiform 4-8 cm. long bract: flowers contiguous at the ends of each branchlet, not at all secund, green or pale-stramineous; bracteoles ovate, obtuse or acutish; perianth 4-5 mm. long, the parts firm, nearly equal, lance-subulate, acute, strongly spreading, yellowish-green with a distinct scarious margin: stamens one half as long as the perianth, anthers oblong, slightly shorter than the filaments: style very short: capsule broadly ovate-oval, $\frac{3}{4}$ - $\frac{7}{8}$ the length of the perianth, rounded apiculate and very obscurely triangular at the apex, placentae reaching half way to the axis: seeds oblong (.37-.45 \times .17-.21 mm.), apiculate at each end, coarsely areolate with 5-7 rows of transversely oblong areoles.

Damp soil in open places, from Maine and New York westward to the Saskatchewan, Colorado and Arizona.

Specimens examined :

MAINE : Aroostook Co. (Fernald, no. 109, K. Furbish), Kennebec Co. (Fernald, no. 2747), Somerset Co. and Orono (Fernald).

VERMONT : (Eggleston & Churchill, no. 404), Willoughby (G. G. Kennedy).

NEW YORK : Ithaca (Dudley and others); Truxton (K. M. Wiegand, Cornell Herb., type); also many other localities.

MICHIGAN : Detroit (Wm. Boott, C. F. Wheeler), Keweenaw Co. (O. A. Farwell, no. 468b).

WISCONSIN : (J. A. Lapham).

MISSOURI : Dixon Co. (F. Clements, no. 2598), Springfield (S. Weller).

KANSAS : Riley Co. (J. B. Norton, no. 528).

NEBRASKA : Hooker Co. (Rydberg, no. 1374), Thomas Co. (Rydberg & Wright, nos. 1845 and 1487).

WYOMING : Lander (A. Nelson, no. 699).

IDAHO : Boise (A. I. Mulford).

COLORADO : Mancos (Baker, Earle & Tracy, no. 424).

ARIZONA : Willow Spring (F. Palmer, no. 550).

The cartilaginous brown auricles, stiff stem and small contracted inflorescence with spreading calyx distinguishes this species from all others of the group. In the vicinity of Ithaca, N. Y., it is quite common, and may be found either in damp open meadows along water courses or preferably in marly soil in which latter situation it reaches its greatest perfection. In the Cayuga Flora Professor Dudley refers to this species as an unnamed variety of *J. tenuis* with tall stems and crowded glomerate heads occurring on the moist meadows of Marl Creek.

Juncus Dudleyi is extremely variable in size, although the floral characters are constant. The largest specimens are coarse, tall and robust with looser sheaths, thinner auricles and more open inflorescence; but all gradations may be found down to the very slender low forms with close sheaths and capitate flowers. These extremes may all be found about Ithaca, N. Y.

13. *JUNCUS DICHOTOMUS* Elliott, Bot. S. Car. and Ga. 1 : 406. 1817

Sparingly tufted, very stout, especially at the base (7-9 dm. high), strict, dark green : culms terete or flattish, shallowly striate :

leaves very long (two thirds the length of the stem) and commonly stout, nearly terete, rarely much channelled; sheaths usually all more or less distinctly blade-bearing, very loose and broad, brownish or purple, margins and rounded auricles almost cartilaginous, not scarious: inflorescence many-flowered, rather large and normally diffuse, rarely contracted, 2-8 cm. long, more or less fuscous; bracts 5-15 cm. long, similar to the leaves, either longer or shorter than the inflorescence; bracteoles acutish, often fuscous: perianth 3.5-4 mm. long, the segments spreading, pungent, nearly equal and similar, greenish-brown with a narrow scarious margin: stamens one half the length of the perianth, anthers oblong, shorter than the filaments: style very short: capsule ovate oblong, rounded, minutely apiculate and very obscurely triangular at the apex, $\frac{3}{4}$ - $\frac{7}{8}$ the length of the perianth; placentae extending half way to the axis: seeds nearly as in *J. tenuis*.

In dry or wet sandy places, Massachusetts to Florida along the coast.

Specimens examined:

MASSACHUSETTS: Chelsea Beach (H. Mann).

NEW JERSEY: Atsion (J. A. Allen), Keyport (G. Thurber), Camden (C. F. Parker, Herb. Junc. Bor. Am. Engelm. no. 24).

DISTRICT OF COLUMBIA: (M. S. Bebb).

VIRGINIA: Princess Anne Co. (Heller, no. 1068).

SOUTH CAROLINA: (G. Thurber, M. A. Curtis), Aiken (Ravenel, Herb. Junc. Bor. Am. Engelm. nos. 25 and 26).

GEORGIA: Summit of Stone Mt. (J. K. Small).

FLORIDA: Apalachicola (Dup. Chapman Herb. Biltmore, no. 2615a), Jacksonville (A. H. Curtiss, nos. 2969 and 5660), Lake Co. (Nash, nos. 555, 1086 and 1881), Middle Fla. (G. Thurber).

Very similar to *Juncus tenuis* but seems to differ strangely from all other forms in the combination of pale fuscous flowers and terete leaves, the latter character apparently being quite constant. The sepals are strongly spreading as in *J. tenuis*, and it also goes through the same characteristic variations as that species in the condensation and expansion of the inflorescence. The extremes are quite unlike in appearance but not essentially different in structure. Small stunted forms are also commonly wiry, slender and strict with filiform leaves. This condition is well exhibited by the two specimens from Lake Co., Fla. (Nash), which are both low and very slender with narrow sheaths. They seem

however to be connected with the ordinary form by numerous transitional specimens especially in the South. A peculiar specimen from Florida and also one from Massachusetts has the auricles and floral characters of this species but possesses more or less distinctly flattened leaves. In case the leaves are slightly flattened *Juncus dichotomus* may still be easily distinguished from *J. tenuis* by the thick auricles, general dark color and sheaths which are commonly tinged with purple. From *J. Dudleyi* it may be known by the diffuse inflorescence with darker flowers and by the purple sheaths.

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